

Section 1 Introduction

Project Overview

Rationale for Project:

The Teacher Preparation Program (TPP) Science Teaching Committee was formed in the spring of 2001 to evaluate the science-teaching curriculum at Yale. This committee was expanded and renamed the Yale Science Teaching/Teacher Preparation Enhancement Team (TEAM) to accommodate the current curriculum standards provided by established agencies including the NCATE 2000 Unit Standards, the American Association for the Advancement of Science (AAAS), the American Society for Cell Biology (ASCB), the CSDE and other curriculum frameworks of accredited Teacher Preparation Programs.

In the beginning TEAM members were Yale faculty from various science departments some of whom were also engaged in educational research and activities related to secondary science teaching. They brought a diversity of professional knowledge and experience in addition to internationally recognized research. The members of the TEAM remain well positioned to change not only Teacher Preparation Program curriculum but also to influence Yale science teaching more broadly. The TEAM operates within the context of a university committed to continually enhancing its own science teaching to produce leadership in research and teaching. A recent university report explains plans to expand science teaching facilities and to revise the undergraduate science programs.

As the Title II project began, the TEAM was working three tasks. First was a list of competencies for secondary science teachers. The focus of the TEAM and Yale TPP is secondary science. While several organizations have prepared documents explaining what secondary graduates as science teachers should know and be able to do, these lists did not provide a common base from which the group could communicate. Therefore the team set out to create its own list derived from: 1) what the professors expect of incoming Yale freshmen; and 2) reports and guidelines from professional organizations such as Connecticut State Department of Education AAAS and NSTA. The list included in Section II: The Assessment Tasks and Deliverables took over twelve months to finalize but proved to be the catalyst for the most productive thinking about teaching science.

The second task was the customization of the current general competency-based portfolio requirements for at least one specific science – biology. The portfolio would

provide descriptions of the competencies, the assessment tools, the rubrics and the scoring guides. The third task was the design a new science methods course to be team taught by three science professors Wolenski, Black and Nelson.

The Title II Project: As The Yale Science Teaching/Teacher Preparation Enhancement Team (hereafter known as the TEAM) began the Title II project, the following list of guiding questions was developed.

1. What is the level of content knowledge in life science, earth sciences, physical sciences and chemistry for students seeking science certification?
2. What is the level of understanding of technology and scientific innovation? Can candidates in the Teacher Preparation Program apply recent advances in technology to science pedagogy?
3. What do candidates know regarding developmentally appropriate teaching and learning?
4. In what ways are the science certification candidates adequately prepared to meet the needs of culturally diverse classrooms? What strategies do they use for customization of science instruction?

Specific goals were established:

1. Incorporate additional Teacher Preparation courses taught by faculty with diverse scientific backgrounds including, but not limited to chemistry, physics and biotechnology.
2. Enlist the participation of local science teachers as educational advisors to the TPP and to the TEAM.
3. Collect data to document the knowledge and skills of TPP graduates.
4. Integrate the use of technology in TPP courses to enhance the learning of science.
5. Design lessons that meld science with economic and social development, including development of laboratory modules that require participation in global problems such as crop development, global warming, over-fishing and slash and burn farming practices in tropical rainforests.
6. Communicate attitudes about science learning that place a high value on the importance of persistence and a strong work ethic.
7. Provide authentic experiences related to cross-cultural perspectives in teaching and learning. Model and encourage reflective teaching using ethnically diverse teaching teams. Include multicultural and gender inclusive science content.
8. Demonstrate how high expectations yield corresponding increases in classroom performance and acquisition scientific knowledge.

Project Deliverables

The deliverables for this project are:

- This report

- A PowerPoint presentation presented December 13, 2002 to CSDE Title II meeting (Disk enclosed.)
- Science Candidate Portfolio instructions and rubric
- Unit instructions and rubric
 - Laboratory Lesson instructions and rubric
 - Problem-based Learning Module instructions and rubric

The members of your workgroup and their institutional role.

Principal Investigator: Otherine Johnson Neisler, Ph.D.

Title: Associate Director, Teacher Preparation Program

Institution: Yale University

Other Team Members: The team is comprised of Yale faculty from departments in Education and Arts and Sciences.

Assistant Principal Investigator: Joseph S. Wolenski, Ph.D. Research Scientist and Lecturer. Department of Molecular, Cellular and Developmental Biology.

Team consultants 1:

- Kenneth Nelson, Ph.D. Research Scientist and Lecturer. Department of Molecular, Cellular and Developmental Biology.
- Iona Black, Ph.D. Lecturer/Researcher. Coordinator and Academic Director: Science, Technology, and Research Scholars (STARS) Program. Department of Chemistry.
- Marilyn Szwed. Lecturer and Coordinator of Student Teacher. Teacher Preparation Program.
- Christine Dimeglio, Ph.D. Lecturer. Department of Chemistry.

Team consultants 2:

- Kurt Zilm, Ph.D. Full Professor. Department of Chemistry.
- Cornelius Beausang, Ph.D. Tenured Associate Professor. Department of Physics.
- Laurie Cardona. Psy.D. Associate Chief Psychologist, Yale Child Study Center. Yale University School of Medicine.
- Junhyong Kim, Ph.D. Assistant Professor, computer science, Yale University
- Nelson Nngoh, Ph.D. University of Bridgeport, Science Methods
- Michele Raynor, the Branford HS Science Department Chairperson
- Angel Tangney, Chemistry teacher, Hill Regional Career High School, New Haven.

Workgroup Collaboration

Not only was the project team comprised of faculty from Teacher Preparation and various science departments but we also recruited a faculty member from the University of Bridgeport

and teachers from two school districts. Often this group met as a whole to facilitate the widest possible sharing of ideas. Small workgroups also included at least one member from each membership segment. The most difficult scheduling was around the secondary teachers' school hours. This problem was addressed through extensive use of web-sites for editing and through email communication. In fact, the use of computer communications was a cornerstone in the success of this project. In Appendix A you will find only a small sample of the types and quantity of email that was exchanged.

Critical Project Features

- Use of a website to place documents for review and editing
- Use of email for virtual meetings, comments, planning and review.
- Use of Internet sites for performance task research.
- On-going circular revision of each task relative to development and learning from other tasks.
- Collection and analysis of student feedback as part of the evaluation of the syllabus for the science methods course which still needs revision.
- Development of two syllabi, Yale and University of Bridgeport, that are very different.
- Review by Irving Richardson
- Decision to totally redesign Yale science methods course summer 2003

See Appendix A for the following:

- Minutes from meetings.
- Email papers, notes, etc.
- Competency List